Research and Engineering Information Available to the War Fighter

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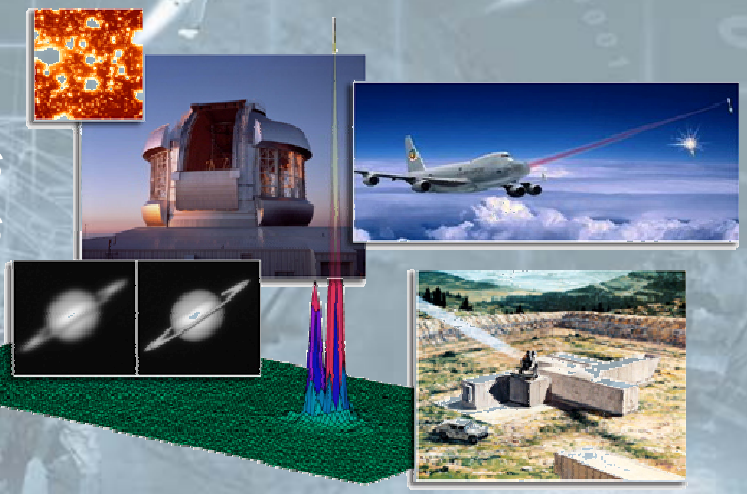
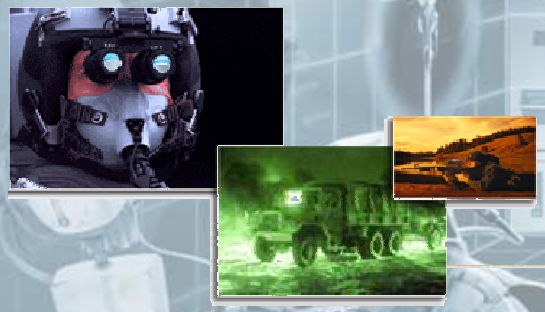
Revolutionary Advances

Stealth

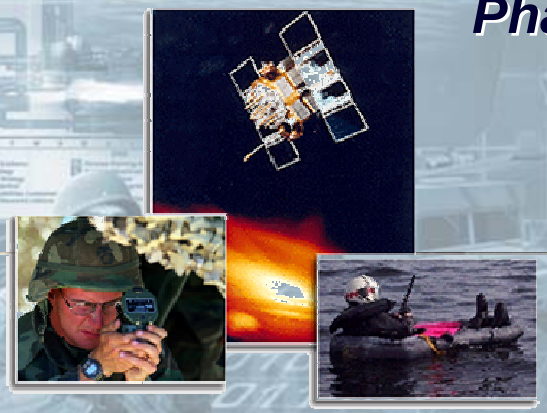


Adaptive Optics and Lasers

Night Vision



GPS



Phased Array Radar


If a great technology is developed in the lab but no one uses it, does it make a difference ….

Some Additional Thoughts

- **“If you want to make enemies, try to change something.” (Woodrow Wilson)**
- **“I think there is a world market for maybe five computers.” (Thomas Watson, IBM Chairman, 1943)**
- **“640K ought to be enough for anybody.” (Bill Gates, CEO of Microsoft, 1981)**
- **“Airplanes are interesting toys but of no military value.” (Marechal Ferdinand Foch, Professor of Strategy, Ecole Superieure de Guerre, 1904)**
- **“It is tough to make predictions, especially about the future.” (Yogi Berra)**

An Uncertain World

- **Intellectual Capital Balance - Globalization of Science and Technology**
- **A Quick Look at Disruptive Technologies**
- **How DTIC Can Help?**

The Globalization of S&T

"In 2001, India graduated almost a million more students from college than the United States did. China graduates twice as many students with bachelor's degrees as the U.S., and they have six times as many graduates majoring in engineering. In the international competition to have the biggest and best supply of knowledge workers, America is falling behind."

--"The World is Flat", Friedman, 2005

China had 15 companies on Forbes Global 500 list in 2004, up by 4 from the 2003 rankings.

India had only 1 company on the Global 500 in 2003. In 2004, there are 4 Indian companies.

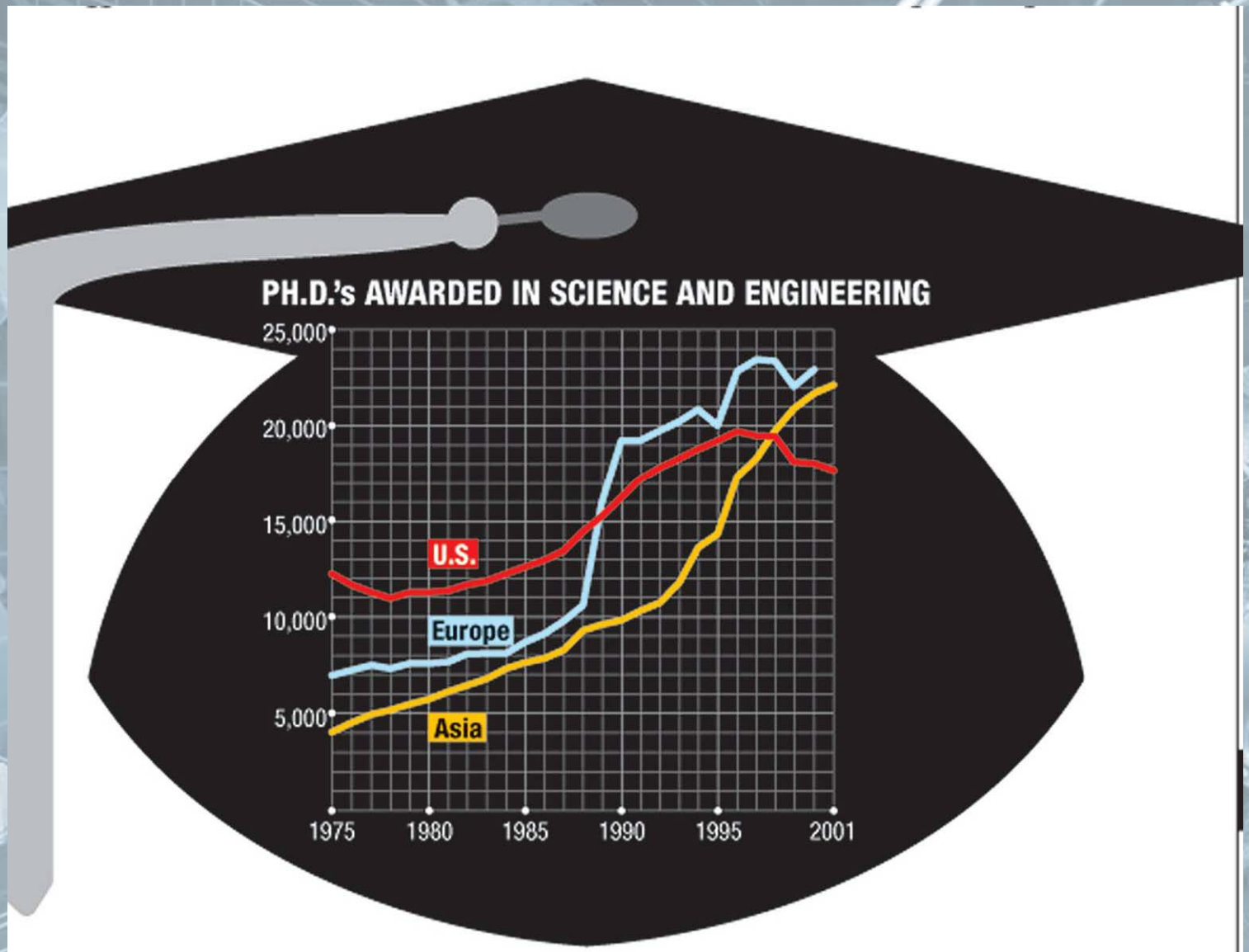
IBM Global Services India unveiled its global delivery centre in Hyderabad on June 14, 2005, the fifth IBM center in India.

China's Gross Domestic Product is now 2nd in the world to the U.S.

" The last 25 years in technology have just been "the warm-up act." Now we are going into the main event, and by the main event, I mean an era in which technology will truly transform every aspect of business, of government, of society, of life."
Carly Fiorina, ex-Hewlett-Packard CEO 2004

For the first time ever, all members of China's Politburo Standing Committee, the highest tier within the Communist Party, are card-carrying engineers.

Comparison of Scientists & Engineers (S&Es)



An Uncertain World

- **Intellectual Capital Balance - Globalization of Science and Technology**
- **A Quick Look at Disruptive Technologies**
- **How DTIC Can Help?**

Disruptive Technology
A Case Study

- **Digital Equipment Corporation:**
  - **1957 -- Founded**
  - **1960 -- Programmable Data Processor 1 (PDP-1) Introduced**
    - **World's First Minicomputer**
    - **10% cost of Mainframe Computers**
  - **1965 -- PDP-8 Rolled-out; World's #1 Selling Computer**
  - **1970's – 1990—DEC #2 International Computer Sales**
  - **1990 -- 120,000 Employees; Revenues $14B**
  - **1998 – Company Bought by Compaq—and Dead**

"It was the sudden demise of DEC that first drew my attention. How could a company, once described by Business Week as a freight train that obliterates all competitors, fall so precipitously?" Interview with Clayton Christensen, Harvard Business School on Line, April 1999

The Pace of Technology Development

"Moore's Law" → Computing doubles every 18 months

"Fiber Law" → Communication capacity doubles every 9 months

"Storage Law" → Storage doubles every 12 months

Defense Acquisition Pace

F-22	**Milestone I:**	**Oct 86**	**IOC:**	**Jun 06***
Comanche	**Milestone I:**	**Jun 89**	**IOC:**	**Sep 09**

*** Computers at IOC are 512 X faster, hold 65,000 X bits of information than they did at MS I**

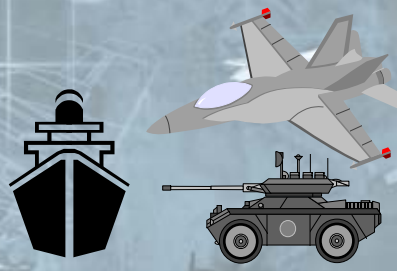
Technology growth is non-linear…
Acquisition path has been linear

Enhancing Technology Transition is Changing the Management Model

All Services are moving their acquisition processes

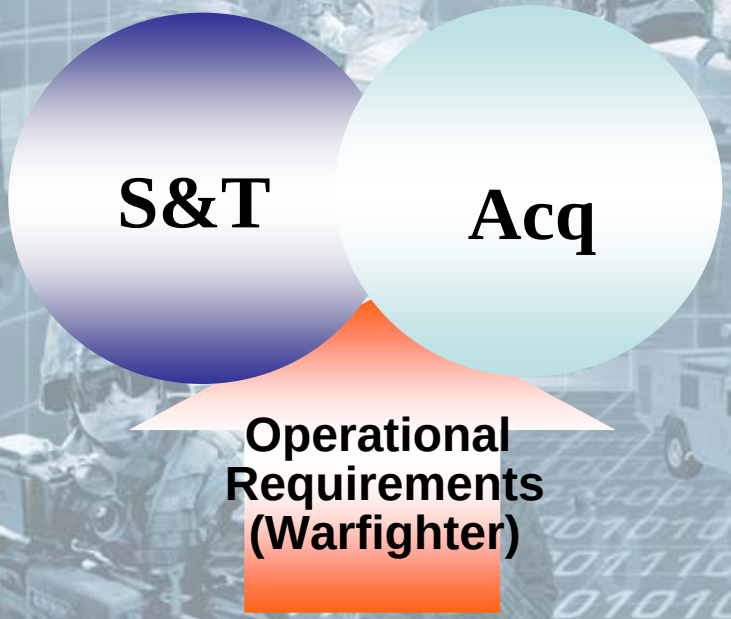
FROM

S&T



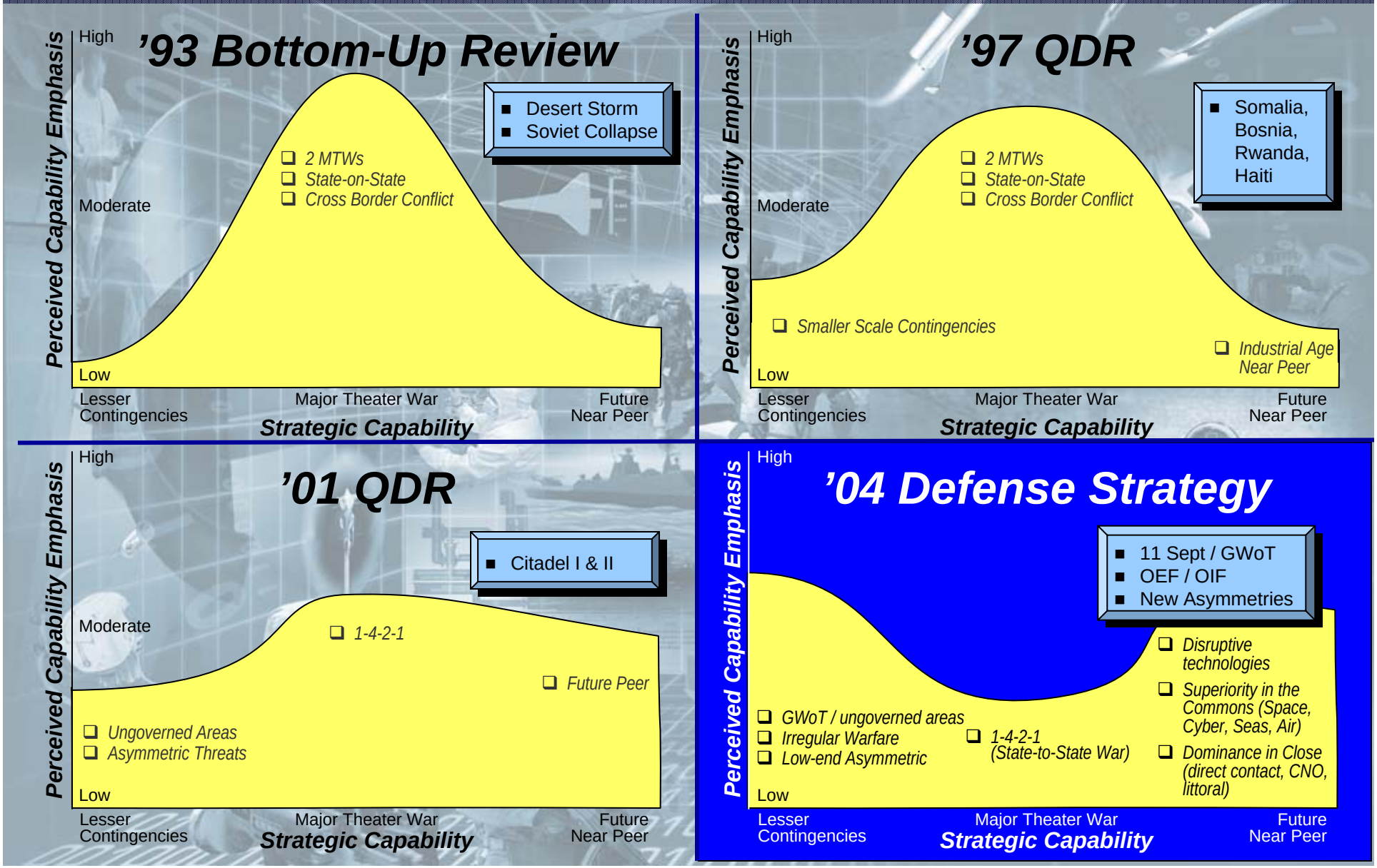
Acq

TO



Developing the Right Technology is a Contact Sport

Decade of Strategic Evolution



Recognition of Disruptive Threats

"…as a matter of common sense and self-defense, America will act against such emerging threats before they are fully formed. We cannot defend America and our friends by hoping for the best. So we must be prepared to defeat our enemies' plans, using the best intelligence and proceeding with deliberation. History will judge harshly those who saw this coming danger but failed to act. In the new world we have entered, the only path to peace and security is the path of action."

The National Security Strategy of the United States (September 2002)

"This strategy calls for continuing to reorient the Department's capabilities to address a wider range of challenges. Although U.S. military forces maintain predominance in traditional warfare, they must also improve their ability to address non-traditional challenges. These include…disruptive threats to the United States' ability to maintain its qualitative edge and ability to project power."

Quadrennial Defense Review 2006

Definition of Disruptive Technology

The Textbook Definition

- Coined by Clayton Christensen* to describe a new, lower-performance (but cheaper) new product that can be improved more rapidly, so that performance outpaces the product it is replacing

- Key concepts:
  - Greater performance than previous product
  - Replaces (drives) old product out of market

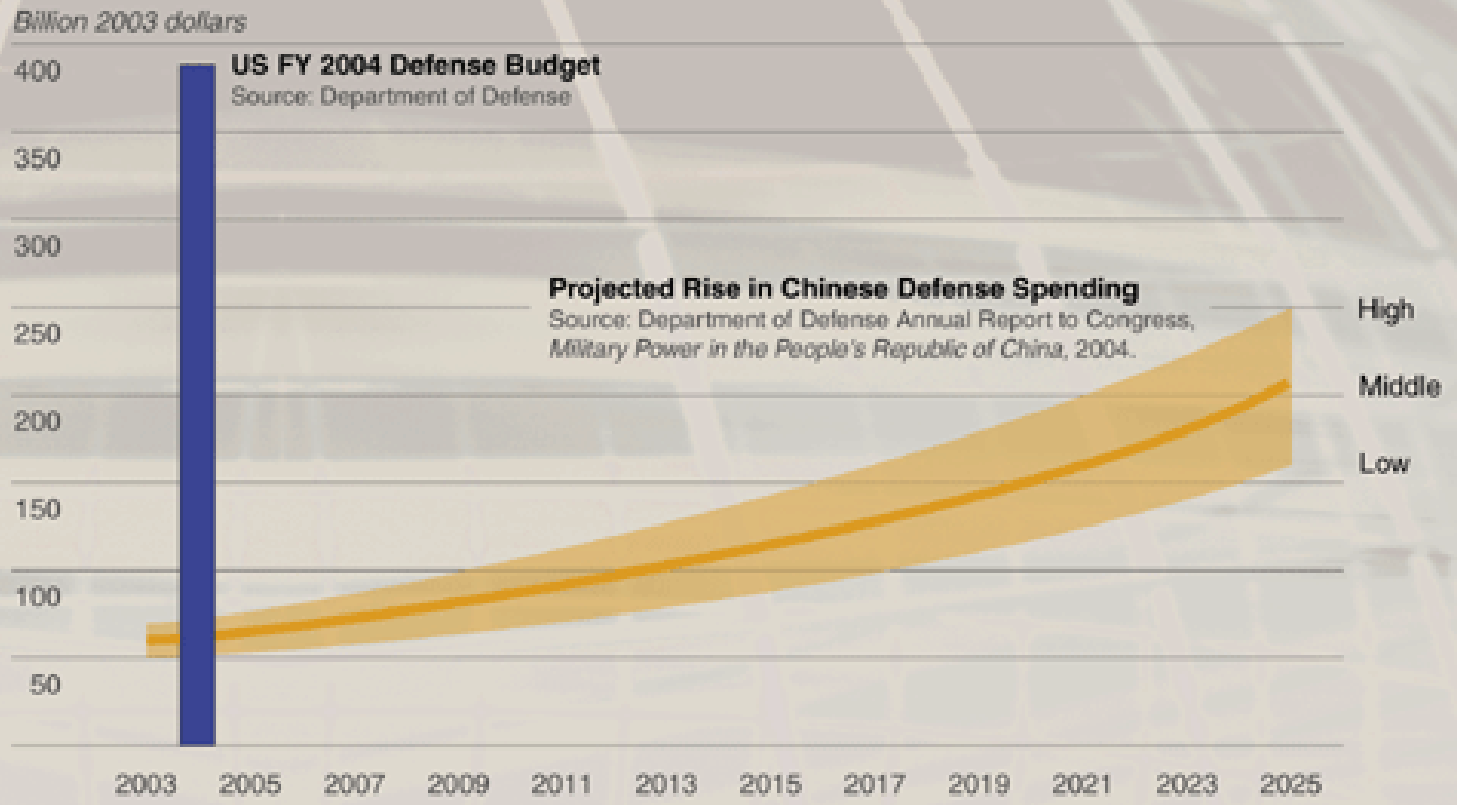
**** "The Innovator's Dilemma", 1997***

Disruptive Technology
The Non-Textbook Definition

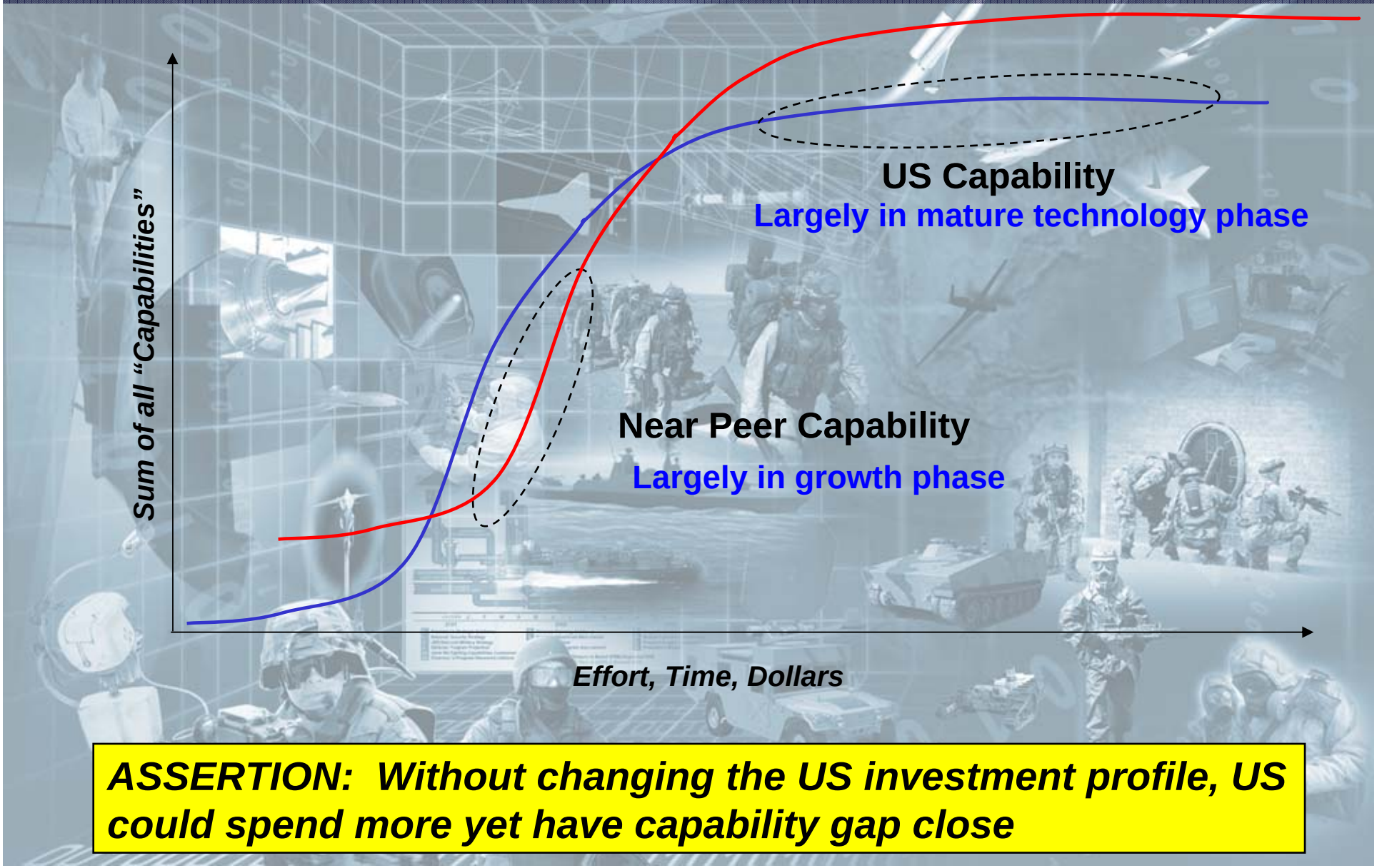
- **Rapid evolution from old, stable technology to new, dominating technology**
- **A technology surprise that gives a competitor an advantage**
  - **Business - Technology that overturns market**
  - **Military - Technology that causes a fundamental change in force structure, basing, and capability balance**
- **Disruptive Technologies can be intended or unintended - but both represent change**
- **Disruptive Technologies may arise from systems or enabling technology**

Rising Powers: The Changing Geopolitical Landscape

Projected Rise in Chinese Defense Spending, 2003-2025



Notional Capability Comparison



ASSERTION: Without changing the US investment profile, US could spend more yet have capability gap close

Trends

- International Science and Technology
- Globalization
- Intellectual Capital Advantage of the US
- Pace of Technology Development
- Types of Combat Operations
- Disruptive Technology

Net Equation—

Uncertainty Increasing

Intellectual Advantage of US Waning

Technical Information Matters

- **Easy access to R&E information for all communities**
- **US and Coalition Warfighting is Technical business**
- **Timescale on getting the answers to operation and technical questions is increasingly shorter**
- **Re-engineering DTIC to be more responsive to broader constituents**

Re-engineering DTIC

- **Defense Technical Information Center (DTIC) established as a DoD Field Activity, June 2004**
  - **Aligned under the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L)**
  - **Reports to the Director, DDR&E**
- **Goals for DTIC**
  - **Closely align technology performers (labs, product centers, non-DoD research organizations, etc.) with the scientific and technical information providers at DTIC.**
  - **Facilitate an enhancement of DTIC efforts to support the USD(AT&L) "E-Business" initiatives in research and engineering.**
  - **Promote the exploitation of emerging information technology tools on dynamic science and technology databases.**
  - **Expand on the synergy of research and engineering facilities, people, and information**

DTIC Splash Page

DTIC
Science and Technology

DoD Wide
Science and Technology
Web Sites

DoD
Web Sites

Search All | Help

Link to Other Search Engines | Link to Federated Search

Can't find a particular site in the results? Click here to submit your site.

or the Warfighter – Register now for the 2006 DTIC Conference, April 3-5, Alexandria, Virginia – Click here t

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DoD R&E Portal

Easy access to R&E Information

Interaction Analysis Dissemination Retrieval Collaboration Collection Wisdom Knowledge Information Data

R&E Portal

- Initiated in 2004 in response to request from DDR&E for an “information transformation”
- Goal - A single site to allow every DoD researcher, acquisition professional, tester, and operator to find, from their desktop computer:
  - What DoD is doing in R&E
  - Why we are doing the work
  - When the work will be done
  - Who knows more about this information
- Launched in April 2005

DoD R&E Portal

R&E Portal

- Provides ***single-point access*** to:
  - All current R&E electronic information
    - Includes all DTIC technical data resources (eg, STINET collection)
    - Includes Defense Science & Technology Planning Documents
    - Includes DDR&E financial databases (Congressional Budget Queries)
    - Include other DDR&E resources (eg, MCTL,
  - E-Gov database of information collected on all 6.1-6.3 programs per Public Law 107-347
  - R&E Points of Contact
  - News Service – *2,300 news sources on 25 S&T topics*
  - DDR&E general information
  - Links to useful sites
  - DoD-wide search of all public .mil websites
- Provides ***intelligent search*** capability of structured libraries
- Has ***Single sign-on capability*** (one password, multi-level security)
- Customer base: DoD R&E community (civil service, military, approved contractors)

Information Available via the R&E Portal

DDR&E Planning Information

Joint Warfighting S&T Plan
Defense Technology Area Plan
Defense Technology Objectives
Basic Research Plan

Dialog NewsEdge

S&T "Early Bird"

Articles updated from 2300 news sources on 25 S&T topics

E-government Database

Information collected on all 6.1-6.3 programs per Public Law 107-347

DTIC Collections

Technical Reports
Research Summaries
Virtual Technology Expo
Biomedical Research Database
In-House S&T Report

Congressional Budget Queries

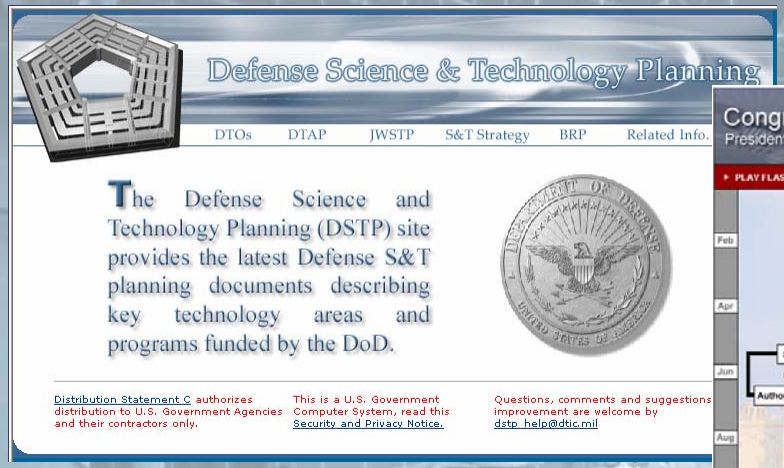
PBR, R-2s, Congressional marks and reports for all 6.1-6.7 funding lines

Defense Technology Search

Ability to "smart search" all Portal information

R&E Forums, Calendars, Files, Announcements

R&E Portal


Defense Science & Technology Planning
DTOs
DTAP
JWSTP
S&T Strategy
BRP
Related Info.
The Defense Science and Technology Planning (DSTP) site provides the latest Defense S&T planning documents describing key technology areas and programs funded by the DoD.
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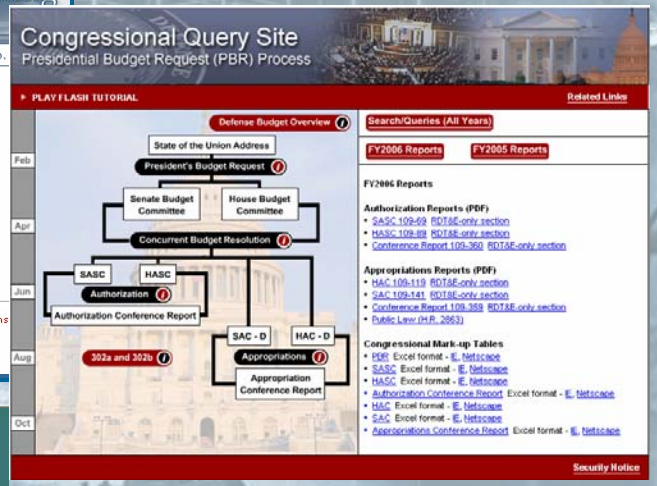
Search DTS
Search Science.gov
Search Firstgov.gov
Search DDR&E
Search DoD-Wide
Enter the
DEFENSE TECHNOLOGY Search


Congressional Query Site
Presidential Budget Request (PBR) Process
PLAY FLASH TUTORIAL
Related Links
Defense Budget Overview
State of the Union Address
President's Budget Request
Senate Budget Committee
House Budget Committee
Concurrent Budget Resolution
SASC
HASC
Authorization
Authorization Conference Report
302a and 302b
SAC - D
HAC - D
Appropriations
Appropriation Conference Report
Search/Queries (All Years)
FY2006 Reports
FY2005 Reports
Security Notice


DoD Web Sites
Search a wide collection of defense websites in multiple domains. This includes many defense agencies, unified commands, the military services - Army, Navy, Air Force, Marine Corps - and other elements of the defense and military establishments.
Search
Advanced
Products
Click boxes below to narrow search to select products (default is all boxes selected).
DoD Agencies
DoD Agencies News
DefenseLink (www.defenselink.mil)
DefendAmerica (www.defendamerica.mil)
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Navy
Air Force
Marines
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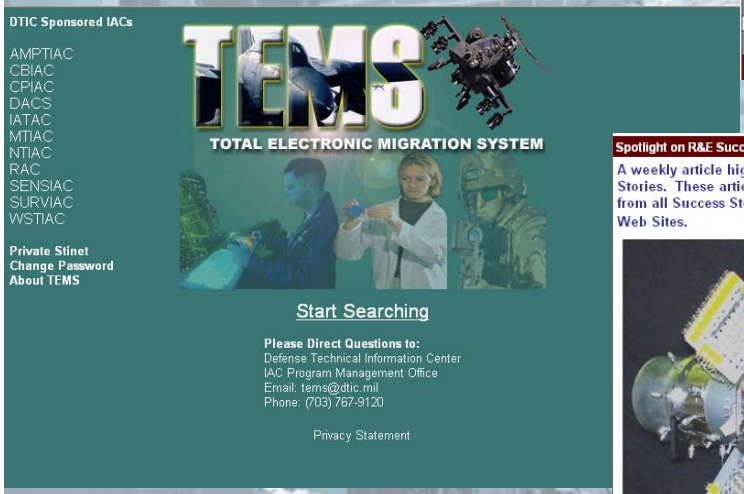
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CBIAC
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DACS
IATAC
MTIAC
NTIAC
RAC
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Start Searching
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IAC Program Management Office
Email: tems@dtic.mil
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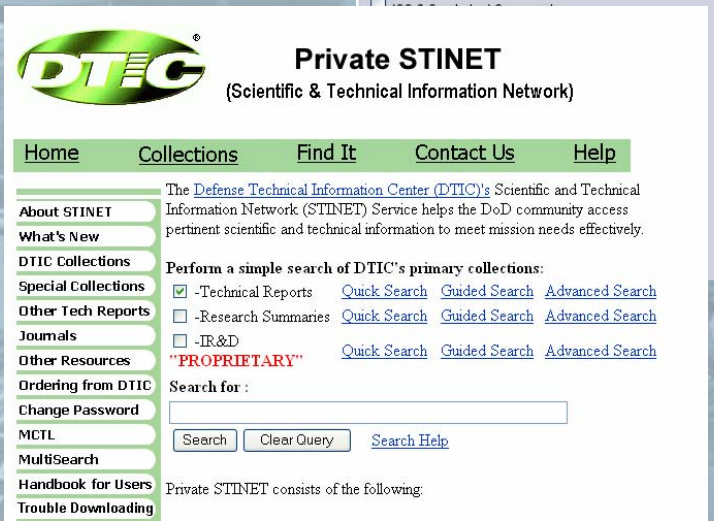
Spotlight on R&E Success
A weekly article highlighting outstanding R&E Success Stories. These articles are randomly selected by DTIC from all Success Stories posted on DOD S&T Laboratory Web Sites.
AFRL COMPLETES SUCCESSFUL SUPERSONIC DEMOSTRATION ENGINE TESTING (Source: AFRL)


DTIC
Private STINET
(Scientific & Technical Information Network)
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Find It
Contact Us
Help
About STINET
What's New
DTIC Collections
Special Collections
Other Tech Reports
Journals
Other Resources
Ordering from DTIC
Change Password
MCTL
MultiSearch
Handbook for Users
Trouble Downloading
The Defense Technical Information Center (DTIC)'s Scientific and Technical Information Network (STINET) Service helps the DoD community access pertinent scientific and technical information to meet mission needs effectively.
Perform a simple search of DTIC's primary collections:
-Technical Reports
-Research Summaries
-IR&D
"PROPRIETARY"
Quick Search
Guided Search
Advanced Search
Search for :
Search
Clear Query
Search Help
Private STINET consists of the following:

Support to Combatant Commanders

- What can the R&E Portal do for you?
  - Information analyses
  - Analytical tools
  - News Sources
  - Links
  - SIPRNET products and tools

Information available to Combatant Commanders

- Who is working on X technology?
- When will it be completed?
- What capability does it enable?
- What is planned for the future?
- Who can I talk to for further information?

Planned Enhancements to the R&E Portal

- **Content**
  - **Personalization**
  - **Expanded R&E POC search**
  - **Additional news sources**
  - **Additional links**
  - **Focus on Services/Agencies**
- **Advanced Tools**
  - **Online “Ask and Expert” reference desk**
  - **Analytical tools**
  - **Data Visualization tools**
  - **Query and data analysis request options**

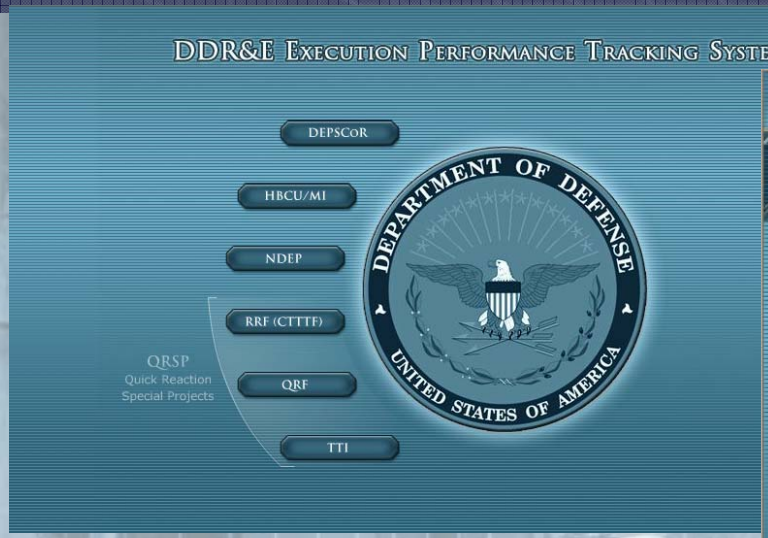
IAC support to Combatant Commanders

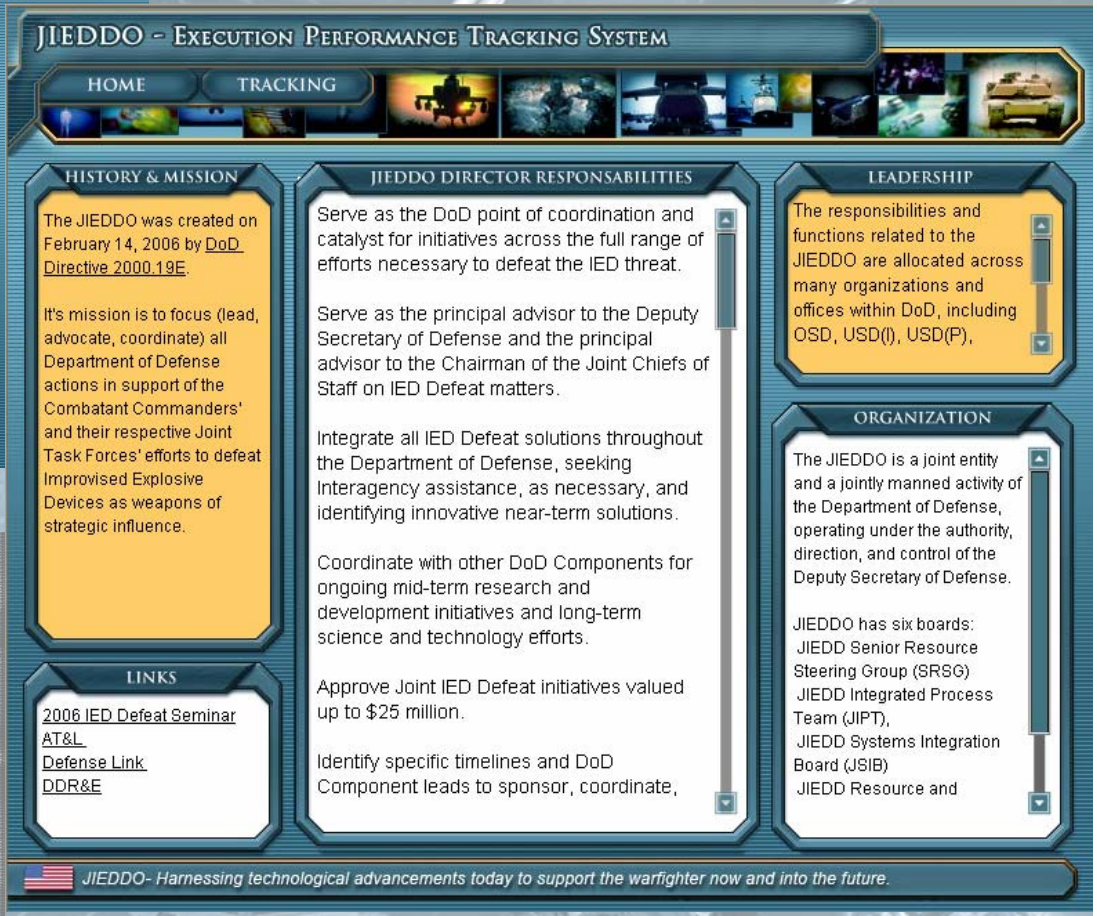
- **JFCOM**
  - **Provides input and technical analysis to concept development, capabilities, and requirements for the improvement of Joint Urban Operation (JUO) training**
  - **Coordinates the integration of Combatant Command, Service, Multinational, and Interagency roles in JUO training**
- **USSTRATCOM**
  - **Responds to a STATCOM request for support for their new Combating WMD mission**
  - **Provides technical, analytical, and planning support to address issues related to the mission of USSTRATCOM**
- **USNORTHCOM**
  - **Enhances CBD and Homeland Security technical training for senior level NORTHCOM staff**
  - **Creates Information Exchange Brokers (IEBs) and three web portals to support information**

IAC support to Combatant Commanders

- **USSOUTHCOM**
  - Conducts research and provided analytical support for operational net assessment (ONA)
  - Provides data collection and ONA analytical support
- **USCENTCOM**
  - Provides assistance in expanding the CIP Program
  - Enhances its FP Program and supported Integrated Base Defense (IBD) initiative to successfully accomplish its warfighting mission.
- **USPACOM**
  - Provides technical expertise in IA/DIO policy and operations, DIO systems engineering, and Joint Experimentation Program support
  - Develops IA integration of the Coalition Deployment Planner (CDP)

Joint IED Defeat Office Support





JIEDDO uses this tool to collect Obligation expenditure amounts, and status descriptions relating to funding, milestones, deliverables, performers, etc) for efforts funded by the Quick Reaction Special Projects program (including the Rapid Reaction Fund (RRF)

Combating Terrorism Technology Task Force Support

Combatting Terrorism Technology Task Force
Meeting Warfigher Needs

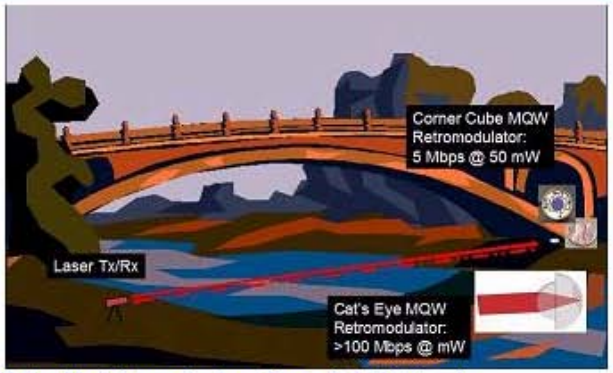
Logout

Home | Overview | Projects | Calendar | CTTTF Staff

CTTTF Portal Updates

Welcome to the Combating Terrorism Task Force (CTTTF) Portal. This section will contain information on the latest updates the CTTTF portal. Thank you for visiting.

Spotlight on CTTTF Success



Retro-Modulators for Free Space Data Retrieval

Asymmetric data link is retro-modulator based. The modulating retroreflector (MRR) is coupled with a sensor and is very small (cm), lightweight (ounces) and requires milliwatts of power to support data rates of megabits per second over carriers not susceptible to rf interference. Transmit/receive unit is remotely located and is transportable. Unit can be deployed easily in the field and can support kilometer-level ranges.

DefenseLink Top News

STANDING GUARD – U.S. Army Spc. Jason Raymond stands guard in a tower draped with camouflage netting at Forward Operations Base Taji in Iraq, March 19, 2006. Defense Dept. photo by U.S. Navy Petty Officer 1st Class Michael Larson Hi-Res Photo | Lead Photo Archive

Bush: Iraq Reaches Historic Moment

WASHINGTON, March 21, 2006 – Sectarian violence that erupted after the Feb. 22 bombing of a mosque in Samarra, Iraq, could have led to civil war. But Iraqis stayed united and are working to build a united government, President Bush said here today. Story

- Supporting Troops Helps Promote Freedom

Cheney Thanks Airmen for Terror War Support

SCOTT AIR FORCE BASE, Ill., March 21, 2006 – Vice President Richard B. Cheney visited the U.S. military's transportation hub here today to thank U.S. troops for their support in the global war on terror and assure them that the country won't abandon Iraq before the mission is completed. Story | Remarks

DDRE

Go to the DDR&E Website

R&E PORTAL DoD Research & Engineering

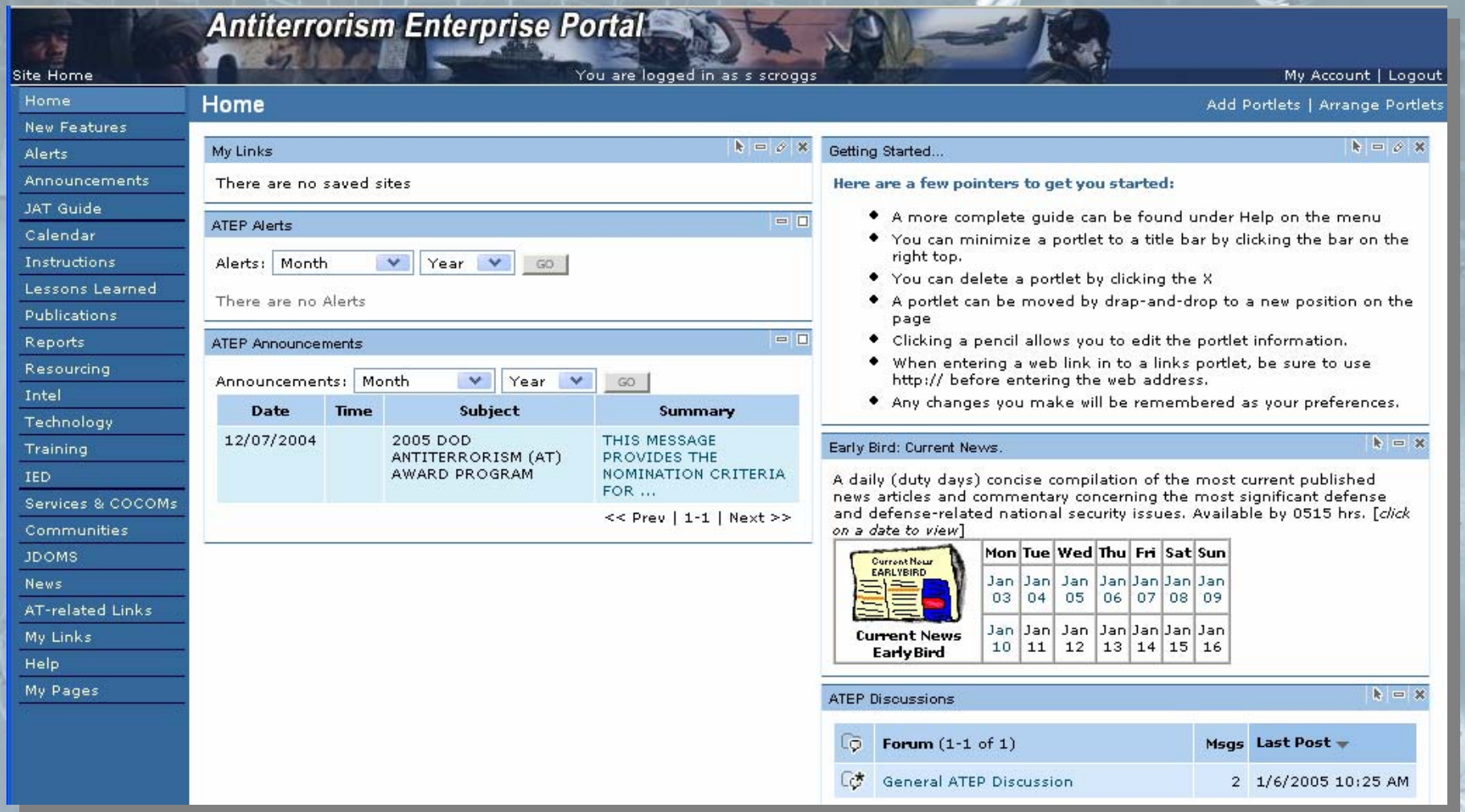
Go to the R&E Portal

Defense Technology Search

CTTTF Links Customize

- AFIS Early Bird
- Air Force Office of Scientific Research
- Army Research Office
- DefenseLink
- DefenseLink List of DoD Sites
- Defense Advanced Research Projects Agency
- Defense Technical Information Center
- DoD TechMatch
- Militarily Critical Technologies List
- Office of Naval Research
- OUSD (AT&L)
- OSD Comparative Testing Office (CTO)
- National Aeronautics and Space Administration
- National Science Foundation
- Research & Development Descriptive Summaries
- Science.gov
- S&T Acquisition Workforce

Antiterrorism Enterprise Portal



Technical Information Matters

- **The rate of change of technology and the volume of global technology information are increasing**
- **Because of this, the risk of technology surprise is also increasing**
- **Efficient access to accurate technical information is vital to ensuring the DoD RDT&E program is responsive to future threats**
- **The R&E Portal is the information support solution of choice for the DoD RDT&E community**

A Couple of Examples

- It took 45 seconds to find out NAWCAD (Patuxent River) is conducting research and has ground tested impact of types of eye goggles for protection from lasers on F-18E/F cockpit—included name of researcher.
- It took 30 seconds to find out the Army (Soldier Systems Command) is developing a precision air drop capability—and gave name and e-mail of POC
- It took three passes, and question refinement to identify a POC at Hq Army who is working on vehicle blast protection.

- Each example over simplified, but, the portal allowed us to find a good POC and information locally to refine follow-up actions

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30 Years Ago DoD S&T Developed Technologies That Changed Warfighting

- Disruptive technologies resulting from technology push:
  - Internet
  - GPS
  - Night vision
  - Lasers
  - Stealth
  - Predator
  - Global Hawk

All provided dominant capability

- *None of these emerged from requirements*



Stealth


UAVs



GPS




Advanced Optics and Lasers


Night Vision

Current DoD Capability Advantages Are 20-25 Years Old

Disruptive Technologies
Frequently Take a Forcing Function

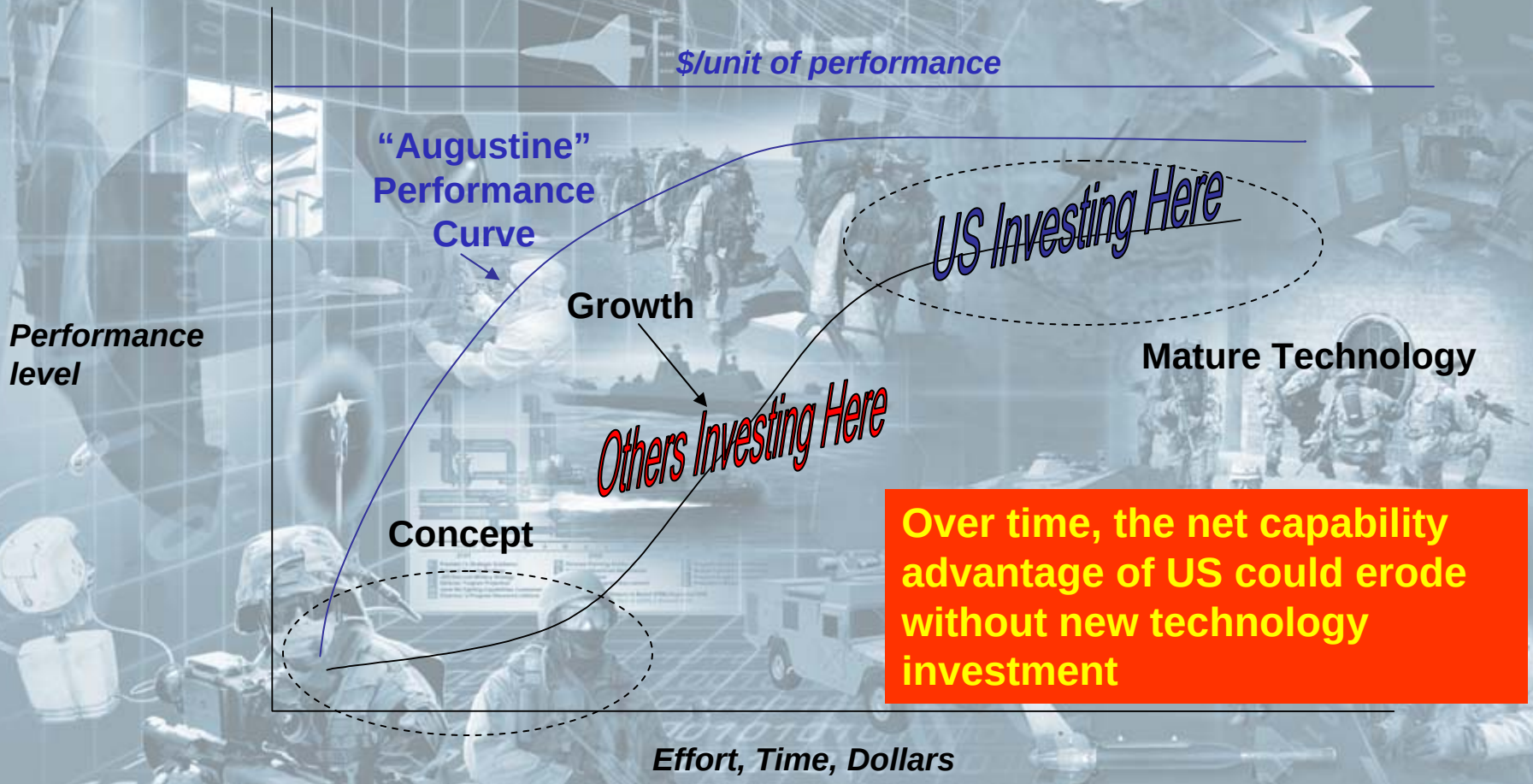
Technology	Approximate Date Of First Lab Demo	Approximate Date of First Military Applications	
Radio	1901	1914	***World War I***
Airplane	1903	1916	
Vacuum Tube	1906	1915	
Mechanized Tank	1916	1916	
Liquid-Fueled Rockets	1922	1944	***World War II***
Radar	1925	1939	
Gas Turbine	1935	1944	
Digital Computer	1943	1945	
Ballistic Missile	1944	1945	
Nuclear Weapons	1945	1945	
Transistor	1948	1957	***Cold War***
Inertial Navigation	1950	1955	
Nuclear Propulsion	1950	1954	
Artificial Earth Satellites	1957	1960	
Integrated Circuit	1960	1970	
Laser	1961	1967	
Precision Weapons	1965	1967	

One function of S&T – Keep the pantry stocked

Diminishing Return?
Technology S-Curve

Most Technology Maturation Follows S-curve:

Initial Discovery, "Productization", then Incremental Improvement



Over time, the net capability advantage of US could erode without new technology investment

Changing Security Environment
- Four Challenges -

Irregular

- Unconventional methods adopted by non-state and state actors to counter stronger state opponents.
- (e.g., terrorism, insurgency, civil war, and emerging concepts)

Catastrophic

- Acquisition, possession, and use of WMD or methods producing WMD-like effects against vulnerable, high-profile targets by terrorists and rogue states.
- (e.g., homeland missile attack, proliferation from a state to a non-state actor, devastating WMD attack on ally)

Traditional

- Military capabilities and military forces in long-established, well-known forms of military competition and conflict.
- (e.g., conventional air, sea, land forces, and nuclear forces of established nuclear powers)

Disruptive

- International competitors developing and possessing breakthrough technological capabilities intended to supplant U.S. advantages in particular operational domains.
- (e.g., sensors, information, bio or cyber war, ultra miniaturization, space, directed-energy, etc)

VULNERABILITY

Lower *Higher*

Higher

Lower

LIKELIHOOD

Uncertainty is the defining characteristic of today's strategic environment

Definition of Disruptive Technology

Some Historical Examples--Commercial

Candle → Electric Light

Vacuum Tubes → Transistors

Mechanical Watches → Quartz Watches

Mainframe Computers → Personal Computers

In each case, the Disruptive Technology decimated the conventional market - in a very short time